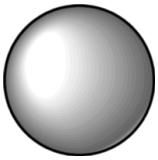
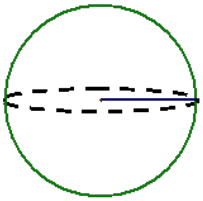
12.6 Surface Area and Volume of Spheres

Sphere-The set of all points in space that are a given distance (radius) to a given point (center).





$A = 4\pi r^2$

$V = \frac{4}{3}\pi r^3$

Ex:
r = 4cm

$A = 4\pi 4^2$
$A = 64\pi \text{ cm}^2$

$V = \frac{4}{3}\pi 4^3$
$85\frac{1}{3}\pi \text{ cm}^3$

Ex:

$V = \frac{32000\pi}{3}\text{ cm}^3$

$A = \frac{1600\pi}{400}\text{ cm}^2$ $\frac{3}{4}\left(\frac{32000\pi}{3} = \frac{4}{3}\pi r^3\right)$

$A = 4\pi 20^2$ $8000 = r^3$

$20 = r$

Ex:

$A = 12\pi \text{ cm}^2$

$V = \frac{4\pi\sqrt{3}\text{ cm}^3}{21.8\text{ cm}^3}$

$r = \sqrt{3}$

$\frac{4}{3}\pi\sqrt{3}^3$

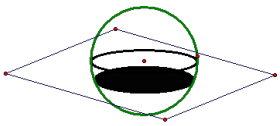
$\frac{4}{3}\pi 3\sqrt{3}$

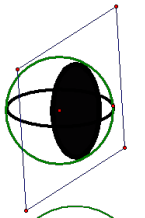
$\frac{4}{3}\cdot 3$

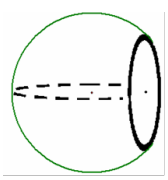
$\sqrt{27}$

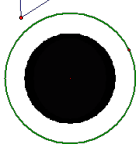
$3\sqrt{3}$

When a sphere and a plane intersect, the intersection is a circle. Try to imagine slicing an orange what two dimensional shape is left where you cut the slice-a circle. Also, imagine pouring water into sphere (bu not filling it) what shape is the surface of the water-a circle. Shown are several views of the intersection



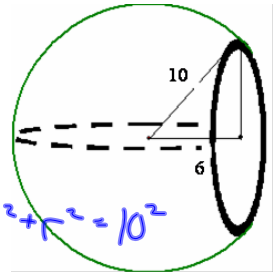






EX:
A plane intersects a sphere 6 cm from the center of the sphere. The radius of the sphere is 10cm. What is the area of the circle formed?

Radius of the circle = 8 cm
(Pythagorean thm.)
Area of the circle = $64\pi \text{ cm}^2$

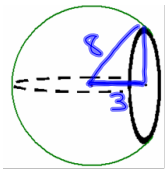


$6^2 + r^2 = 10^2$

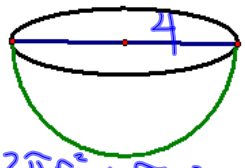
EX:
A plane intersects a sphere 3 cm from the center of the sphere. The radius of the sphere is 8cm. What is the area of the circle formed?

Radius of the circle = $\sqrt{55}$ cm
(Pythagorean thm.)
Area of the circle = 55π cm^2

$3^2 + r^2 = 8^2$
$r = \sqrt{55}$



The great circle occurs when the slice is taken at the hemisphere.



A Sphere $4\pi r^2 = 2\pi r^2 + \pi r^2 = 3\pi r^2$

What is the SA of the hemishpere, if the area of the great circle is 16 π? $= \pi r^2$

$SA = 2\pi 4^2 + \pi 4^2$
$= 48\pi$ u^2

HW
p842-844
#s 3, 4, 7, 10,11, 17, 23, 33

FINDING SURFACE AREA Find the surface area of the sphere. Round your answer to two decimal places.

3. 

4. 

USING A GREAT CIRCLE In Exercises 7–9, use the sphere below. The center of the sphere is C and its circumference is 9.6π inches.

7. Find the radius of the sphere.

10. **ERROR ANALYSIS** *Describe* and correct the error in finding the surface area of a hemisphere with radius 5 feet.

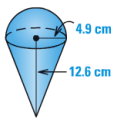
$S = 4\pi r^2$
$= 4\pi(5)^2$
$= 100\pi$
≈ 314.16 ft^2

11. **GREAT CIRCLE** The circumference of a great circle of a sphere is 48.4π centimeters. What is the surface area of the sphere?

USING VOLUME In Exercises 16–18, find the radius of a sphere with the given volume V. Round your answers to two decimal places.

17. $V = 91.95$ cm^3

COMPOSITE SOLIDS Find the surface area and the volume of the solid. The cylinders and cones are right. Round your answers to two decimal places.

23. 

33. ★ **SHORT RESPONSE** Tennis balls are stored in a cylindrical container with height 8.625 inches and radius 1.43 inches.

a. The circumference of a tennis ball is 8 inches. Find the volume of a tennis ball.

b. There are 3 tennis balls in the container. Find the amount of space within the cylinder not taken up by the tennis balls.